NUTRITIVE VALUE OF BROWSE PLANTS IN THE SUDAN SAVANNA OF NORTH WEST NIGERIA

I. PRELIMINARY SURVEY OF BIN-YAURI GRAZING RESERVE

By

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SUMMARY

TWENTY-TWO plant species common to Sudan Savanna zone were identified as useful browse from a survey of Bin-Yauri grazing reserve in the Sokoto State of North West Nigeria. Leaf samples of the browse collected the peak period of the dry season showed high nutritive values with crude protein above 14 percent in majority of them. IVDMD was positively and significantly correlated with crude protein ($r=0.89$). Mineral contents were also high in all cases except that few species were low in phosphorus.

Importance of browse to make up nutrient deficiencies in animals during dry season is emphasised. It is also argued that the higher CP in the browse ingested should improve nitrogen levels for animals resulting in their increased feed intake and digestibility of low quality forages during dry season. Hence, animals having access to some browse species should tide over the dry season without serious weight losses as compared to the ones restricted to grazing.

INTRODUCTION

MORE than 90 percent of cattle and 60 percent of sheep and goats in Nigeria are concentrated in the seasonally dry and arid parts of the North (F. A. O. 1966) where transhuman husbandry is the common practice. In this area, moisture primarily dictates the type and the amount of fodder available. During wet season, quality and quantity of forage from grasses are satisfactory. In the dry season even though supply of fibrous dry grass, which is potentially a source of energy, may be unlimited, its poor quality provides only a sub-maintenance diet to the animals. Therefore, animals depending on roughage tend to loose during the dry season as much as 15 percent of the body weight attained at the end of the previous rainy season (de Leeuw, 1971; Zemmeling,

1974). Free grazing animals having access to a variety of browse plants however suffer less. This is generally attributed to the higher nutritive value of browse as compared to grass (Rose Innes and Mabey, 1964). Importance of browse is well known to the farmers in West Africa and only few studies have so far considered its potentials in Nigeria (Brinckman and de Leeuw, 1975; de Leeuw, 1975). A comprehensive programme to evaluate browse plants in the country has therefore been undertaken by the department of Agronomy, University Ibadan.

This preliminary report is on the nutritive potential of browse in the Bin-Yauri grazing reserve ($10^{\circ}53'N, 4^{\circ}45'E$) in the Sokoto State. This reserve has an area of 65 sq km and receives a rainfall of 1100 mm essentially between the months of May and September. Dry season extends from October to April and highest water deficit of 150 mm is recorded in March (Kowal and Knabe, 1972). During this season therefore the principal grass species such as *Andropogon gayanus* and *Pennisetum Pedicellatum* remain parched with an average of 2 percent crude protein (CP) while trees and shrubs leaf out (Rains, 1963; Brinckman and de Leeuw, 1975). According to records kept at the zonal veterinary office, Yelwa, this grazing reserve serves approximately a migratory herded animal population of one million of which 44,000 and 35,000 are breeding stocks of cattle and sheep respectively (MANR, 1978, personal communication).

MATERIALS AND METHODS

In traditional pastoralism, the grazer has ample knowledge of the area and is able to identify herbage species useful to his stock from the ones that are harmful. In early April, 1978 two of the authors followed two graziers and their herds in the Bin-Yauri grazing reserve with a view of collecting browse plants. Samples comprising only leaves were collected immediately on seeing animals nibbling a plant. Local names of the plants were immediately recorded. Scoring for browse preferences was done based on the animals behaviour and graziers knowledge. The names and other information collected in the field were later verified from some other resident graziers and literature.

The samples were then brought to the camp and sub-samples were taken in polythene bags and transported securely to Ibadan within 24 hours. In the lab the samples were botanically identified, dried at 60°C for 48 hours, milled in a wiley mill and analysed for CP, crude fiber (CF), and minerals using A.O.A.C. methods (1970). The milled samples were also subjected to *in vitro* dry matter digestibility (IVDMD) using the two stage technique of Tilley and Terry (1963).

RESULTS AND DISCUSSION

A list of browse available identified by their local and scientific names and their preferences by animals is presented in Table 1. Leguminaceous plants domi-

TABLE 1
Common Browse species in Bin-Yauri Grazing Reserve

Species	Family	Local name	
		Hausa	Fulani
Heavily browsed			
<i>Acacia sieberiana</i> * Dc	Mimosaceae	fara kaya	gei daneji
<i>Azelia africana</i> Sm.	Caesalpinaceae	kawo	gayohi
<i>Grewia mollis</i> Juss	Tiliaceae	dargaji; daragaza	kurukubi
<i>Khaya senegalensis</i> (Desr) A. Juss.	Meliaceae	madachi	dalehi, kahi
<i>Pterocarpus erinaceus</i> Poir.	Papilionaceae	madobia	banuhi
<i>Strychnos spinosa</i> Lam.	Loganiaceae	kokiya	kumbija
Moderately browsed			
<i>Crossopteryx febrifuga</i> Benth.	Ruaceae	kasfiya; karkoshia	rima jo'ohi
<i>Daniellia oliveri</i> * (Rolfe) — Hutch & Dalz.	Cabillphiniaceae	maj; kadaura	kaharlahi
<i>Dichrostachys cinerea</i> * Dc.	Mimosaceae	dundu	burli
<i>Ficus sycomorus</i> * Linn.	Moraceae	baure	yibe
<i>Gardenia erubescens</i> Staf and Hutch.	Rubiaceae	gaude	—
<i>Jasminum paciflorum</i> Benth.	Oleaceae	—	buhudehi
<i>Kigelia africana</i> (Lam) Benth	Bignoniaceae	rawuya; giri	jirlahi
<i>Mitragyna inermis</i> (Willd) O. Kuntze	Rubiaceae	giyega	koli or kwoli
<i>Securinega virosa</i> (Roxb ex Willd.) Bail.	Euphorbiaceae	tsa	—
<i>Strychnos innocua</i> Del.	Loganiaceae	jan kokiya	kumbiya
<i>Vitex doniana</i> * Sweet	Verbenaceae	dinyar	galbihi
Occasionally browsed			
<i>Bryocarpus coccineus</i> Schum & Thorn	Connaraceae	—	—
<i>Burkea africana</i> Hook	Caesalpinaceae	bakan-makarfo	kokobi
<i>Butyrospermum paradoxium</i> * Hepper	Sapotaceae	tryan-dutse	—
<i>Combretum nigricans</i> Lepr. ex Guill & Perr	Combretaceae	ka'danya (Kade)	kareje
<i>Ficus platyphylla</i> * Del.	Moraceae	chiriri; degera	—
		gamji	dundehi

* Fruits and seeds are also eaten.

nate and account for about 27 percent of the browse in the grazing reserve. It is evident that some are browsed heavily than the others. In some parts of the reserve heavily browsed ones such as *Azelia africana* are devoid of foliage in the lower branches and the upper branches are lopped for the animals using pole knives. Thorns of some species such as *Acacia sieberiana* are no deterrent in browsing animals. In addition to foliage flowers, fruits and seeds are also eaten.

Many factors can account for species preferences by animals. Heavily browsed ones were relatively high in CP and low in CF. Why some species with high fiber and low protein were more preferred to the ones with low fiber and high in protein is not clear. For example animals preferred *Gardenia erubescens* and *Kigelia africana* to *Bryocarpus coccineus* and *Burkea africana*. Therefore differences in chemical composition alone may not explain the variability in animals preferences for browse. Caution should

however be exercised in using or extrapolating data on browse ratings. Even the same species within a given ecological zone have been differently rated in different countries. This may occur when samples different in their abundance and nutritive value are compared at different times of the year (Wilson, 1969).

Nutritive value of browse collected is given in Table 2. Crude protein content in the herbage even though ranged from 5.25 to 21.8, majority of them were between 12 to 16 percent. The CF was below 30 percent in the majority of the browse plants with a maximum of 37.9 percent in *Gardenia erubescens*.

Mineral contents in the browse were generally high. Phosphorus content varied greatly and it ranged between 0.06 to 0.41 percent in the herbage of *Strychnos innocua* and *Butyrospermum paradoxum* respectively (Table 2). Greater variability was also noted in the IVDMD. Highest

TABLE 2
Nutritive Value of Browse Species in Bin-Yauri Grazing Reserve in the late Dry Season

Browse species	Chemical Composition in Dry matter										%
	%					ppm					IVD-MD
	CP	CF	P	K	Ca	Mg	Fe	Mn	Zn	Cu	
<i>Acacia siebertiana</i>	18.51	28.0	0.20	0.96	1.12	0.16	203	91	82	28	68.6
<i>Azelia africana</i>	21.80	26.3	0.39	2.02	2.04	0.32	241	103	82	24	69.0
<i>Grewia mollis</i>	16.24	26.2	0.19	1.61	0.72	0.33	180	92	92	24	65.0
<i>Khaya senegalensis</i>	16.30	33.3	0.18	1.05	0.94	0.19	152	92	72	31	68.0
<i>Pterocarpus erinaceus</i>	12.28	31.9	0.13	1.61	1.29	0.30	216	81	84	29	55.0
<i>Strychnos spinosa</i>	15.00	28.8	0.23	0.71	0.83	0.57	202	79	64	26	65.8
<i>Crossopteryx febrifuga</i>	10.00	30.0	0.23	1.22	1.32	0.20	172	69	48	31	49.0
<i>Daniella oliveri</i>	15.56	34.0	0.24	1.76	1.20	0.37	261	89	65	27	55.0
<i>Dichrostachys cinerea</i>	14.55	29.9	0.24	1.62	0.96	0.29	271	92	69	30	62.0
<i>Ficus sycomorus</i>	14.38	30.5	0.32	1.34	1.28	0.24	412	41	75	24	56.4
<i>Gardenia erubescens</i>	6.25	37.9	0.20	0.60	0.92	0.21	183	35	25	16	40.0
<i>Jasminium paciflorum</i>	14.50	26.1	0.34	0.84	0.95	0.28	169	81	62	28	56.0
<i>Kigelia africana</i>	5.25	31.4	0.31	1.01	0.69	0.28	168	81	73	26	35.6
<i>Mitragyna inermis</i>	15.08	30.6	0.18	1.34	0.93	0.32	194	85	80	32	54.2
<i>Securinega virosa</i>	15.25	32.0	0.33	1.10	1.02	0.31	158	44	31	29	52.0
<i>Strychnos innocua</i>	15.81	29.8	0.06	1.04	1.34	0.39	182	60	50	34	66.7
<i>Vitex doniana</i>	13.79	31.2	0.24	1.81	1.51	0.23	124	66	48	22	54.3
<i>Bryocarpus coccineus</i>	16.58	32.0	0.19	1.28	0.98	0.31	241	78	91	29	62.0
<i>Burkea africana</i>	15.01	30.0	0.22	1.56	1.03	0.29	198	76	77	31	68.0
<i>Butyrospermum paradoxum</i>	7.09	31.6	0.41	1.41	1.26	0.34	219	78	94	27	47.0
<i>Combretum nigricans</i>	12.99	34.2	0.18	1.69	1.17	0.30	252	96	64	29	53.0
<i>Ficus platyphylla</i>	5.50	31.2	0.12	1.50	1.12	0.34	394	68	72	29	42.9

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digestibility of 70 percent was noted in *Azelia africana* while *Kigelia africana* was only 36 percent digestible. Highly significant correlation ($r = 0.89$) was found between IVDMD and CP.

Animals in areas experiencing alternate wet and dry seasons tend to loose weight, the extent of which depends upon:-

- (a) the length of dry season
- (b) the level of supplementation
- (c) the amount of herbage available from browse plants.

According to Zemmeling (1974), a 250 kg steer in the northern Guinea zone of Nigeria loses as much as 300 to 400g daily unless provided with 100 to 130g digestible CP in concentrates. Assuming a 2 percent dry matter appetite and a 3 percent digestible CP for maintenance as considered by Lansbury (1960), a 250 Kg steer would require a total of 150 g digestible CP to prevent weight losses. Animals feeding on grass with a 2 percent CP alone during the dry season would not benefit from this. Based on established relationships it may be concluded that the digestibility of CP tends to approach zero below 3.7 percent (digestible CP — 0.899 CP — 3.25; Milford and Minson, 1966). Low protein levels causes reduced forage intake and digestibility in animals. For example, consumption of *Andropogon gayanus* by heifers decreased from 76 to 47 g per Kg metabolic body weight when CP of the hay decreased from 5.35 to 2.35 (Zemmeling, Hagger and Davies, 1972). Low digestibility of forages with CP below 6 to 7 percent is attributed to the insufficiency of N for rumen microbial activity (Glover and Dougall, 1960; Milford and Minson, 1966). This explains the low digestibility of some browse species with low protein levels. Animals having the only option of feeding on grass and other roughages during the dry season may not eat to their full capacity and therefore may suffer from protein deficiency as well as from energy shortages (Zemmeling, 1974). Hence, animals having access to high protein browse could be expected to consume more and show high digestibility of low quality forages by increasing the overall level of

digestible CP in the diet. Amount of browse in the diet of animals vary and tends to be higher with decreasing grass/browse density. In East Africa a 35 percent browse contribution in the diet of grazing animals during dry season has been reported (Payne and MacFarlane, 1963).

Browse plants are usually higher in minerals. Hence mineral deficiency in the roughages may be offset in the animals consuming some browse. As animals browse on mixtures rather than concentrating on any single species, trees and shrubs with high P contents may compensate for species that have less than the prescribed minimum of 0.18 percent P in the herbage tissues for beef cattle (Reid and Jung, 1974). Higher P needs of the animals may also be provided through supplementation.

Nutritive value of browse plants does not suffer from seasonal fluctuations (Rose, Innes and Mabey, 1964). They seem not to be eaten by animals when fresh grass forage is in ample supply (Payne and MacFarlane, 1963). How can the surplus forage from browse under utilised by animals during such period be profitably used or saved is a matter for conjecture at the moment. Browse alone may be inadequate as a feeding stuff. But because of their usefulness to animals in the arid regions, preservation of these plants during range renovation has been suggested. With this, a policy for regulating browsing just as for grazing is also needed for optimum benefit from this feed source.

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